T03D05 – Periodicity SL Material Practice MS

1. B
2. A
3. D
4. D
5. B
6. D
7. (i) *Li to Cs*
atomic radius increases;
because more full energy levels are <u>used</u> or <u>occupied</u>/<u>outer</u> electrons
further from nucleus/outer electrons in a higher shell;
ionization energy decreases;
because the electron removed is further from the nucleus/increased repulsion by inner-shell electrons; 4
Accept <u>increased</u> shielding effect.

(ii) *Na to Cl*
atomic radius decreases;
because nuclear charge increases **and** electrons are added to same main (outer) energy level;
ionization energy increases;
because nuclear charge increases **and** the electron removed is closer to the nucleus/is in the same energy level; 4
Accept "core charge" for "nuclear charge".
In (i) and (ii) explanation mark dependent on correct trend.

[8]

8. Oxides of: Na and Mg are basic;
Al is amphoteric;
Si to Cl are acidic;
Ar has no oxide;
*All four correct award **[2]**, two or three correct award **[1]**.*
$Na_2O + H_2O \rightarrow 2NaOH$ **and** $SO_3 + H_2O \rightarrow H_2SO_4$; 3
Must be balanced for mark.
Award marks for alternative correct equations such as SO_3 with NaOH.

[3]

9. (i) Mg has greater nuclear charge/greater charge on cation/more valence e^-/greater number of delocalized electrons/Na has lesser nuclear charge/lesser charge on cation/less valence e^-/lesser number of delocalized electrons; stronger attraction between cation and <u>delocalized</u>/<u>free</u>/valence electrons; 2
*If neither mark scored, accept stronger metallic bonding in Mg for **[1 max]**.*

(ii) giant/network/lattice/macromolecular structure;
many/strong <u>covalent</u> bonds (need to be broken); 2

(iii) (simple) molecular substances;
weak van der Waals'/dispersion/London forces <u>between</u> molecules; 2
"Weak intermolecular forces" not sufficient for second mark

[6]

10. $IE_S < IE_O$:
valence electron in S in n = 3, in O in n = 2/e□further away/S has another electron shell/atomic radius of S greater than that of O;
less attracted to nucleus/experiences greater screening from inner electrons;
$IE_S < IE_P$:
electron removed from S is paired;
greater repulsion due to two electrons in the <u>same</u> (p) orbital/<u>paired</u> electrons in S; 4

[4]

11. (i) minimum energy required to remove one (mole of) electron(s) from (one mole of) (a) gaseous atom(s)/*OWTTE*; 1

(ii) $2Li(s) + 2H_2O(1) \rightarrow 2LiOH(aq) + H_2(g)$/$Li(s) + H_2O(1) \rightarrow LiOH(aq) + 1/2H_2(g)$; 1

State symbols not required

(iii) (ionization energy) decreases;
radius increases/valence electrons further away from nucleus/ electron removed from higher shell;
(nuclear charge increases but) shielding/screening effect increases/ more electrons between nucleus and valence electron/lower effective nuclear charge/Z_{eff}; 3

(iv) phosphorus has a higher (effective) nuclear charge/Z_{eff};
radius of P is smaller;
electron pair/bonding electrons attracted more strongly; 2

(v) both have same number of protons/14 protons/nuclear charge/core charge;
Si^{4+} formed by electron loss, Si^{4-} formed by electron gain;
Si^{4+} : 2.8 arrangement/2 (complete) energy levels/electrons in n = 2;
Si^{4-} : 2.8.8 arrangement/3 (complete) energy levels/electrons in n = 3;
explanation of proton : electron ratio;
higher effective nuclear charge/Z_{eff} in Si^{4+}; 4

[11]